

Five members of the crew were seriously injured when attempting to batten down one of the hatches, and the full list of 200 passengers were confined to their staterooms with seasickness during the fury of the storm.

The storm settled down about the vessel early in the evening of July 23. It came without warning and with severe fierceness, according to officers of the ship. (*San Francisco Examiner, August 11, 1920.*)

Argentina.—About the 14th of the month Buenos Ayres was visited by a snowstorm this being the second experienced within 300 years.¹

Australia.—Floods in Australia have done much damage to wheatlands, and heavy rains, followed by destructive floods, have occurred in Western Queensland.¹

¹ The Meteorological Magazine, Aug., 1920, 154-155, 180.

DETAILS OF THE WEATHER OF THE MONTH IN THE UNITED STATES.

CYCLONES AND ANTICYCLONES.

By R. HANSON WRIGHTMAN, Meteorologist.

Cyclones.—Alberta LOWS were the most frequent and there were few secondary developments. The table shows the number of LOWS by types.

LOWS.

	Alberta.	North Pacific.	South Pacific.	Northern Rocky Mt.	Colorado.	Texas.	East Gulf.	South Atlantic.	Central.	Total.
July, 1920.....	4.0	0.0	0.0	2.0	1.0	0.0	0.0	1.0	3.0	11.0
Average number, 1892-1912.....	4.9	0.7	0.3	0.5	0.9	0.2	0.1	0.1	0.9	8.6

Anticyclones.—The Alberta type was by far the greatest in number, as shown by the table which follows:

HIGHS.

	North Pacific.	South Pacific.	Alberta.	Plateau and Rocky Mountain region.	Hudson Bay.	Total.
July, 1920.....	1.0	1.0	6.0	0.0	1.0	9.0
Average number, 1892-1912.....	1.3	0.3	3.0	1.2	0.8	6.6

NOTE.—Since the inauguration of tables, giving the numbers of HIGHS and LOWS each month, in the January, 1920, number of the MONTHLY WEATHER REVIEW, it has been noted that the numbers of HIGHS and LOWS has exceeded in most cases the average for the period 1892-1912, and in a number of cases to a considerable extent. This seeming abnormality is, however, apparent rather than real, for in the greater part of the period for which the averages are computed, only the most important HIGHS and LOWS were plotted, whereas at the present time the policy is to track all HIGHS and LOWS that affected the weather to any considerable extent and this can be followed for 3 or more consecutive 12-hour periods on the weather map.

THE WEATHER ELEMENTS.

By P. C. DAY, Climatologist and Chief of Division.

[Weather Bureau, Washington, Sept. 1, 1920.]

PRESSURE AND WINDS.

The distribution of pressure over the United States and Canada during the month was according to the usual summer type, although the averages were above the normal for the month in all districts save over the eastern shores of the Great Lakes and along the St. Lawrence Valley where they were slightly below.

No storms of importance traversed extensive paths, but pressure was moderately low over eastern districts on the 3d and 4th, and a LOW that developed over the Plains region about the middle of the first decade had a fairly distinctive movement to the Great Lakes and St. Lawrence Valley during the following few days. Also on the 18th pressure was moderately low in the Lake region and during the following two days, overspread the more eastern districts.

The areas of high pressure were much better defined than the LOWS and entered the United States from the Canadian territories to eastward of the Rocky Mountains, instead of from the far northwestern part of the United States, as is frequently the case during the summer months.

The general circulation of the atmosphere exhibited the usual sluggish conditions common to the mid-summer period, and winds of high velocity were infrequent, save in connection with local thunderstorms. High pressure over the southeastern States favored southerly winds over nearly all districts from the Plateau region eastward to the Atlantic coast, except along the Canadian border from the Great Lakes to the Pacific where they

were frequently from northerly or westerly points. Along the immediate Pacific coast they were in the main from some westerly quarter.

TEMPERATURE.

Low pressure over the Central Valleys and to the westward during the first week of the month induced southerly winds and high temperatures over most districts, but particularly between the Mississippi River and the Rocky Mountains where maximum temperatures frequently ranged from 90° to 100° or more. Some of the highest temperatures of the month were recorded during this period over the East Gulf and South Atlantic States. About the 8th, higher pressure advanced into the middle Plains and a change to somewhat lower temperatures occurred over most districts. As the high area moved eastward, there was a general but slow return to the summer type of low pressure over the interior districts with a corresponding rise in temperature to about the normal near the end of the second week.

By the middle of the month a change to higher pressure had again brought cooler weather into the Central Valleys, extending thence eastward during the few days immediately following. In the Northwest and far West the temperatures continued generally slightly above normal during most of the first half of the month, the highest readings occurring on the 7th and 8th over Arizona, New Mexico, Utah, and portions of adjoining States.

During the early part of the third decade the development of low pressure over the districts between the

Great Lakes and Rocky Mountains again favored high temperatures in the Central Valleys and the maxima of the month, ranging frequently from 95° to 100° or more, were recorded from the 21st to 24th over nearly all northern and central districts from the Rocky Mountains eastward, except over the extreme northeastern States where the highest temperatures were observed on the 12th and 13th.

Lower temperatures overspread the Great Lakes and surrounding districts on the 25th and the weather continued cool for the season over much of the country from the Rocky Mountains eastward during the following few days. By the end of the month, however, high pressure had gradually shifted to the southeastern districts and temperatures had risen to normal or above over all portions of the country save in the Dakotas and portions of adjoining States where cooler weather had again set in.

The average temperatures for the entire month were above normal in practically all districts from the Great Plains westward. In portions of Montana the daily temperatures were above normal the entire month and the monthly mean was the highest ever recorded in any month. The eastern half of the country had monthly means somewhat below normal over practically all portions.

Along the Atlantic coast from the Carolinas to southern New England the average temperatures were again below normal as has been the case during practically all the months of the present year. In fact at some points the average temperature for each month in that period has been below normal. This condition has probably been caused in part by the low temperature of the adjacent ocean waters which are reported to have been colder than ever before known.

At Atlantic City the average water temperature was about 8° below the normal and the lowest of record for July.¹

PRECIPITATION.

The rainfall during the month was confined mostly to local storms as is usual during the midsummer period. A few low areas, developing in the far West or Northwest, appear to have maintained their identity through the Mississippi Valley and thence eastward, and several Lows originating in the Great Plains pursued their usual courses to the Great Lakes and St. Lawrence Valley or over New England.

Thunderstorms were frequent and occasionally heavy and damaging during the first two decades over much of the middle and eastern portions of the country, this being particularly the case from the Ohio Valley and Lake region eastward to the Middle Atlantic States from the 2d to 4th, and in the Middle Plains and thence northeastward to the Great Lakes from the 5th to 7th. A general rainy condition overspread the Gulf States about the end of the first decade and extending northward and eastward brought substantial showers over much of the country from the Mississippi River eastward. Precipitation was again more or less general about the middle of the month from the upper Mississippi and lower Missouri Valleys eastward. About this time precipitation set in over Arizona and the far Southwest where the usual summer rains, frequently beginning during the last half of June, had been greatly delayed.

In the latter part of the second decade beneficial rains occurred over most States east of the Mississippi River and frequent showers continued in the far Southwest. During the last decade of the month there was

generally much less rain in all districts, save in the far Southwest, than in the two preceding, the latter half especially being without material precipitation over large areas. Local showers continued during the last decade in Arizona and portions of surrounding States, some heavy falls being reported locally in Colorado about the middle of the decade.

The precipitation for the month was less than normal over extensive areas, particularly from the lower Ohio Valley and Great Lakes westward. The deficiency was large in portions of the middle Mississippi Valley and generally over the Plains region and the Southwest, the fall in Arizona and portions of surrounding States being in many cases little more than half the normal. However, only limited areas suffered seriously from lack of sufficient moisture. In portions of Illinois no rain fell after the 10th and drought became serious by the end of the month.

Over the upper Ohio drainage and thence eastward and northeastward the precipitation was well distributed during the month and very generally in excess of the usual fall for July, and considerable areas in the Gulf and south Atlantic States had amounts above the normal. The rainfall was quite unequally distributed, as might be expected when falling in connection with thunderstorms, this being particularly true of the Gulf and Atlantic States where in comparatively near-by localities the total monthly falls frequently varied as much as 10 inches. Likewise in portions of the middle West, large variations occurred, notably at Kansas City, Mo., the total fall for the month, 9.78 inches, was the greatest ever recorded at that station in July, while at other points in the State the monthly amounts were less than 1 inch.

RELATIVE HUMIDITY.

Despite frequent showers during the greater part of the month over most districts from the Mississippi Valley eastward, the percentage of relative humidity was very generally less than the average, and on the whole it was less than average over the greater part of the western mountain and Pacific coast States, some exceptions being noted, however, principally in central California, where values considerably above normal were observed. In the Plains States the averages were mainly above normal, with local exceptions.

SEVERE LOCAL STORMS.

On July 1, near Blair, Nebr., a small tornado was observed, but without material damage, and on the 16th in the same State press dispatches mentioned the occurrence of a tornado at Neligh, with heavy property damage.

Some severe hail and wind storms were reported during the month, a particularly severe one occurring in the vicinity of Cincinnati, Ohio, on the 8th. Growing crops were greatly damaged, fruit was beaten from trees, and small animals killed. Also near Rouse, Colo., on the 8th a severe hailstorm completely ruined crops over an area about 4 miles wide and 14 miles long, and near Pueblo, Colo., on the 15th a severe hailstorm caused much damage to growing crops.

In the vicinity of Cattaraugus County, N. Y., a severe wind and hailstorm on the 8th caused widespread damage. The fall of hail was unusually heavy; the ground, being covered, gave the appearance of a winter snowstorm.

Near Wichita, Kans., a severe wind and hail storm on the 31st caused damage to crops and buildings estimated at \$800,000.

¹ See MONTHLY WEATHER REVIEW, June, 1920, 48: 352-353.